

[摘 要]

《联合国气候变化框架公约》规定，各缔约方应在公平的基础上，根据它们共同但有区别的责任和各自的能力，为人类当代和后代的利益保护气候系统。《公约》要求所有缔约方提供温室气体各种排放源和吸收汇的国家清单，促进有关气候变化和应对气候变化的信息交流。中国国家气候变化对策协调小组组织国内有关政府部门、社会团体、科研机构、大专院校和企业等有关单位的官员和专家，根据非附件一国家信息通报编制指南，编写了《中华人民共和国气候变化初始国家信息通报》。本报告所涉及的内容和全国性数据，除行政区划、国土面积和其他特别注明的以外，均未包括香港、澳门特别行政区和台湾省。

一、国家基本情况

中国陆地面积约960万平方公里，毗邻的海域面积约473万平方公里。大陆性季风气候显著和气候类型复杂多样是中国气候的两大特征。中国降水的时空变化显著，降雨多集中在夏季，且地区差异很大。中国的地势西高东低，形成三个明显的阶梯，山地、丘陵和高原约占总面积66%。中国的水资源短缺、时空分布不均。人均水资源拥有量约为世界的四分之一，人均能源资源占有量不到世界平均水平的一半。

中国是世界上人口最多的国家。1994年中国大陆总人口为119850万人，就业人员总数为67455万人，三次产业就业人员之比为54.3 : 22.7 : 23.0。1994年中国的城市化水平为28.5%，2000年城市化水平提高到36.2%。

中国是一个低收入的发展中国家，地区经济发展存在显著的不平衡。1994年国内生产总值为46759亿元，人均仅为3901元，三次产业的结构为20.2 : 47.9 : 31.9。1994年农村居民家庭人均纯收入为1221元，城镇居民家庭人均可支配收入3496元。1994年中国人均生活电力消费为72.7千瓦时。1994年中国东中西人均GDP之比为1 : 0.59 : 0.44。

二、国家温室气体清单

1994年中国国家温室气体清单的范围包括：能源活动、工业生产过程、农业活动、土地利用变化和林业及城市废弃物处理的温室气体排放量估算，报告了二氧化碳（CO₂）、甲烷（CH₄）和氧化亚氮（N₂O）三种温室气体的排放。

能源活动清单报告的范围主要包括：矿物燃料燃烧的二氧化碳和氧化亚氮排放；煤炭开采和矿后活动的甲烷排放；石油和天然气系统的甲烷逃逸排放和生物质燃料燃烧的甲烷排放。工业生产过程清单报告的排放源包括：水泥、石灰、钢铁、电石生产过程的二氧化

碳排放；以及己二酸生产过程的氧化亚氮排放。农业活动清单报告的范围主要包括：稻田、动物消化道、动物粪便管理的甲烷排放；农田、动物粪便的氧化亚氮排放。土地利用变化和林业活动清单报告的范围主要包括：森林和其他木质生物碳贮量的变化，以及森林转化为非林地引起的二氧化碳排放。城市废弃物处理清单报告的范围主要包括：城市固体废弃物处理的甲烷排放、城市生活污水和工业生产废水的甲烷排放。

1994 年国家温室气体清单基本采用了《IPCC 国家温室气体清单编制指南（1996 年修订版）》（以下简称《IPCC 清单指南》）提供的方法，并参考了《IPCC 国家温室气体清单优良作法指南和不确定性管理》（以下简称《IPCC 优良作法指南》）。清单编制机构基于对中国的排放源界定、关键排放源确定、活动水平数据可获得性和排放因子可获得性等情况，分析了 IPCC 方法的适用性，确定了编制 1994 年国家温室气体清单的技术路线。

根据清单估算结果，1994 年中国二氧化碳净排放量为 26.66 亿吨（折合约 7.28 亿吨碳），其中能源活动排放 27.95 亿吨，工业生产过程排放 2.78 亿吨，土地利用变化和林业部门的碳吸收汇约 4.07 亿吨；甲烷排放总量约为 3429 万吨，其中农业活动排放 1720 万吨，能源活动排放约 937 万吨，废弃物处理排放约 772 万吨；氧化亚氮排放总量约为 85 万吨，其中农业活动排放约 78.6 万吨，工业生产过程排放约 1.5 万吨，能源部门排放约 5.0 万吨。按照 IPCC 第二次评估报告提供的全球增温潜势数据计算，1994 年中国温室气体总排放量为 36.50 亿吨二氧化碳当量，其中二氧化碳、甲烷、氧化亚氮分别占 73.05%、19.73% 和 7.22%。

为了减少温室气体清单估算结果的不确定性，重点加强了数据、方法和报告格式等几个方面的工作。在保证数据的准确性方面，尽可能采用官方的统计数据，并配合进行抽样调查和实际测试工作，同时参照《IPCC 清单指南》和《IPCC 优良作法指南》中推荐的默认值。在方法方面坚持遵循 IPCC 方法，并根据中国国情加以改进，保证了清单估算结果具有可比性、透明性和一致性。在报告格式方面，尽可能采用《公约》非附件一国家信息通报指南推荐的格式。

本清单尚存在着一定的不确定性，主要因素有：首先，中国作为发展中国家，数据统计基础比较薄弱，尤其是在与估算温室气体排放相关的活动水平数据的可获得性方面还存在很多困难；其次，在能源、工业生产过程、农业、土地利用变化与林业、废弃物处理部门中，不同程度地采用了抽样调查、实地观察测量等方法来获取编制清单所需的基础信息，由于资金、时间等客观因素的制约，观测的时间尺度、观测点和抽样点的代表性还不够充分。

影响中国未来温室气体排放的因素主要包括：人口增长与城市化水平提高，经济发展与消费模式变化，人民生活基本需求的增长，经济结构调整与技术进步，林业与生态建设。分析表明：一方面，中国未来的基本生活需求与经济发展将产生更大的温室气体排放需求；另一方面，由于中国贯彻实施可持续发展战略，在排放量增长的同时，也在自身的能力和水平允许的范围内，努力降低排放增长的速度，为减缓全球气候变化作出积

极贡献。

三、气候变化的影响与适应

中国从20世纪90年代初开始进行气候变化的影响、脆弱性与适应性评估的研究，主要研究的领域集中在与国民经济密切相关的四个领域：水资源、农业、陆地生态系统、海岸带和近海生态系统。应用的影响评估工具模型主要是从国外引进的，自主开发的模型不多，评估工作还是初步的，存在很大的不确定性。初步研究结论如下：

近百年中国气候变化的趋势与全球气候变化的总趋势基本一致，20世纪90年代是近百年来最暖时期之一；从地域分布看，中国气候变暖最明显的地区是西北、东北和华北，长江以南地区变暖趋势不明显；从季节分布看，中国冬季增温最明显。1985年以来，中国已连续出现了16个全国大范围的暖冬；中国降水以20世纪50年代最多，以后逐渐减少，特别是华北地区出现了暖干化趋势。在假定大气中CO₂浓度从1990年起渐进递增至2100年，并考虑气溶胶浓度变化的情景下，不同全球气候模式对中国气候变化的情景预测存在一定的差异，但总趋势是一致的，即中国将持续不断地变暖，降水也将增加。对于未来极端天气/气候事件的研究目前还很少，有限的结果表明，在未来气候变暖大背景下，中国的极端气候冷害事件呈减少趋势，而极端高温事件应是增加的；干旱和洪涝灾害将增加。

对中国主要江河径流量的观测结果表明，近40年来六大江河的实测径流量呈下降趋势。20世纪80年代以来，华北地区持续偏旱。与此同时，中国洪涝灾害也频繁发生，特别是进入90年代以来，多次发生大洪水。SRES A2、B2情景下的影响评估显示：北方径流深减少而南方径流深增加。这将加剧北方的水资源短缺，影响社会的可持续发展。自20世纪气候变暖以来，中国山地冰川普遍退缩，西部山区冰川面积减少了21%。在气候变暖情景下，冰川融化对近期出山径流的减少将起到一定程度的缓解作用，但对未来的冰川水资源利用有较大的威胁。

气候变暖后，由于作物生长加快，生长期普遍缩短，这将影响物质积累和籽粒产量。由于气候变化的不利影响，导致农业生产费用增加。现有的评估表明：气候变化对中国主要农作物的影响以减产趋势为主。气候变暖将影响气候资源的时空分布，相应的种植制度也将发生改变，一熟制地区的面积将减少23.1%，两熟制地区将北移至目前一熟制地区的中部，而三熟制由当前的13.5%提高到35.9%，其北界也将北移500公里左右，由长江流域移至黄河流域。气候变暖后，中国主要作物品种的布局也将发生变化。模拟结果表明：在现有的种植制度、种植品种和生产水平不变的前提下，到2030~2050年间，由于气候变化和极端气候事件会使粮食生产潜力降低约10%，其中小麦、水稻和玉米三大作物均以减产为主。

气候变化对中国物候的影响显著。观测表明：随着20世纪80年代以来中国东北、华北和长江下游春季增温，物候期提前。在CO₂浓度倍增情景下，中国的植被带或气候带将向

高纬或向西移动,植被带的范围、面积、界限将相应变化。全球气候变化对中国西南、华中和华南等地区的森林影响最大。气候变化对中国森林初级生产力地理分布格局没有显著影响,森林生产力和产量呈现不同程度的增加;但由于气候变化后病虫害的爆发和范围的扩大、森林火灾的频繁发生,森林固定生物量却不一定增加,各树种适宜面积均减少。在CO₂浓度倍增情景下,中国北方牧区的气候将会变得更加干暖,各干旱地区的草场类型将会向湿润区推进,即目前的草原界线将会东移;模拟预测表明,全球变暖对中国的冻土、沼泽、荒漠都将产生显著影响。

20世纪50年代以来,中国沿岸海平面呈上升趋势,近几年尤为明显,海平面上升的平均速率约为1.4~2.6毫米。中国科学家应用中国海平面变化预测模型,计算了到2100年中国沿岸5个区域相对海平面的变化范围在31~65厘米之间,未来全球气候变暖引起的海平面继续上升将加剧中国海岸的侵蚀过程。由于海平面的上升,中国沿海江河潮水沿河上溯范围加大,从而影响到河流两岸淡水供应,并使水质降低。

已采取的适应措施主要包括:颁布了13部相关法律和条例;建设水利工程,如大江大河防洪堤防建设、南水北调等;调整农业结构和种植制度;抗逆品种的选育和推广;建立自然保护区、森林公园和天然林保护区等。

拟采取的适应措施主要包括:节水型农业和工业;生态环境保护和建设;选育抗逆和抗病抗虫新品种;退耕还牧、退耕还林还草;改善农业基础设施;控制和制止毁林及各种生态破坏;扩大自然保护区;加强并建立防治森林、草原火灾和病虫害的监测、预测和预警机制;提高江河防洪标准,加强沿海防潮设施建设。

四、与减缓气候变化相关的政策措施

20世纪80年代以来,中国根据自身的国情和能力,通过采取各种政策措施,做到了以较低的能源消费增长速度和较低的温室气体排放增长速度,支持了经济的快速发展,为减缓温室气体排放量的增长、保护全球气候作出了积极的贡献。

1992年以来,中国政府采取了一系列行动和措施,有效地推动了中国的可持续发展进程。1994年制定和发布了中国的可持续发展战略——《中国21世纪议程》。2003年,中国政府进一步制定了《中国21世纪初可持续发展行动纲要》。根据可持续发展的原则和精神,制定了多部有关保护自然资源和环境的法律。从20世纪80年代后期,中国政府开始注重经济增长方式的转变和经济结构的调整,将降低资源和能源消耗、提高资源和能源的利用效率、推进清洁生产、防治工业污染作为中国产业政策的重要组成部分。国务院及国家计委等部门分别颁布了《关于当前产业政策要点的决定》、《90年代国家产业政策纲要》和《当前国家重点鼓励发展的产业、产品和技术目录》等政策。1990年以来,国家关闭了一大批技术落后、能耗和物耗高、污染严重的企业。中国对节能项目制定并实施了一系列财政、信贷和税收等经济激励政策,包括对节能技术改造、节能设备购置实行信贷贴息、差

别利率、免征进口环节增值税、减征企业所得税和加速折旧等；对资源综合利用、城市生活垃圾发电、风力发电和农村可再生能源项目实行税收优惠等。

20世纪80年代以来，中国政府在能源部门实施了一系列改革和政策措施，优化了能源结构，促进了能源部门的技术进步和效率的提高。煤炭投资和价格实现了市场化；石油天然气工业进行了重组，成立了中国石油天然气股份有限公司和中国石油化工股份有限公司，原油、成品油价格基本实现了与国际市场的接轨；电力行业建立了多元化的电力投资和所有权关系，完成了电力部门的政企分离。从制定国民经济和社会发展第六个五年计划开始，中国政府把编制能源发展规划和节能规划纳入国家的国民经济和社会发展规划中。到2000年，中国政府已编制了“六五”至“十五”节能规划以及每年的节能计划，为中国的能源发展和节能工作设定了分阶段的具体发展目标、重点项目和主要政策。从1995年到2000年，中国水电装机容量年均增长8.7%。到2000年，已运行的核电机组210万千瓦，在建的核电机组660万千瓦；已建成并网风电场26个，风电场装机容量由1994年的3万千瓦增加到2000年的37.52万千瓦。1990至2000年，中国完成小火电机组替代1310万千瓦。1996年至2000年，关停5万千瓦及以下的凝汽式小火电机组约为1000万千瓦。从1995年到2000年，30万千瓦及以上的火电机组占火电总装机容量的比重由22.5%提高到34.4%。同期，热电联产装机容量由1653.8万千瓦提高到2867.6万千瓦，年均增长11.6%。石油和天然气在中国一次能源生产中的比重，由1994年的19.5%上升到2000年的25.2%。根据国家扶贫目标和农村能源发展目标，国家制定和实施了一系列支持和扶持新能源和可再生能源发展的政策措施。截至2000年，中国在1500多个县开发了农村水电，已建成农村水电站4万多座，装机容量2480万千瓦，年发电量约800亿千瓦时。除了风能和小水电以外，中国还在农村大力推广省柴节煤灶、沼气、太阳能、地热等技术。1994年和2000年可再生能源利用量折合标准煤分别为1026万吨和3357万吨。

长期以来，中国政府始终坚持“能源开发与节约并举，把节约放在首位”的方针。20世纪80年代以后，国务院和各级政府主管部门制定和实施了一系列的节能规章，建立了中央、地方和行业、企业三级节能管理体系，实施了一系列节能技术政策，开展了全国“节能宣传周”，建立实施了能效标准、标识和认证制度，有效地推动了节能和提高能效工作。从1980年到2000年，中国GDP能源强度年均下降5.32%。

中国历来重视高耗能行业的节能降耗工作。钢铁工业在1990年至2000年的十年间，钢产量翻了一番，而钢铁工业总能耗仅增加34%；同期，化学工业万元产值能耗年均下降5.15%；建材工业采取了一系列的措施，使建材产品能源单耗普遍下降。

20世纪80年代以来，国务院及建设部等有关部门先后发布实施了一系列政策和规定，指导和规范了建筑部门的节能工作，如《关于加快墙体材料革新和推广节能建筑意见的通知》、《建筑节能技术政策》和《民用建筑节能管理规定》等。发布的建筑节能标准主要有《民用建筑节能设计标准（采暖居住建筑部分）》、《建筑外窗空气渗透性能分级及其检测方

法》、《民用建筑照明设计标准》、《民用建筑热工设计规范》、《旅游旅馆建筑热工与空气调节节能设计标准》、《既有居住建筑节能改造技术规程》和《夏热冬冷地区居住建筑节能设计标准》等。从1992年开始，建设部开展了建筑节能试点，至2000年底，中国累计建成节能建筑1.8亿平方米。在1996~1998年期间“中国绿色照明工程”共推广高效照明电器产品2.67亿只，照明节电量达到172亿千瓦时。

20世纪80年代以来，中国政府有关部门制定和实施了《铁路节约能源管理暂行细则》、《铁路节能技术政策》、《交通行业实施节约能源法细则》、《汽车报废标准》、《铁路工程设计节能规定》、《汽车、船舶节能产品公布规则》、《汽车排放污染物限值及测试方法》等规章制度和标准。中国机动车替代燃料技术的开发和应用也取得了一定进展，截至2003年底，“空气净化工程——清洁汽车行动”在全国建立了16个清洁汽车重点推广试点，燃气汽车保有量达到19.3万辆，建成加气站594座。

20世纪80年代以来，中国普遍实行了草场家庭承包责任制，明确了草原建设与保护的责、权、利，调动了广大牧民发展牧业生产、保护和建设草原的积极性。在牧草良种繁育和推广方面，年牧草种子播种面积达到4万公顷；飞播牧草150万公顷，草场植被覆盖度提高到80%以上；累计建成人工草场、改良草场1600万公顷，围栏草场1000万公顷，累计防治鼠虫灾害9000万公顷。

1980年以来，中国先后制定和修订了《森林法实施条例》、《森林防火条例》、《森林病虫害条例》、《退耕还林条例》和《城市绿化条例》等；建立了森林生态效益补偿制度、全民义务植树制度、林价制度、林业基金制度、造林贷款制度、森林认证制度等。自1978年以来，中国先后实施了包括“三北”、长江中上游等重点地区防护林体系建设、天然林资源保护等十大林业生态建设工程。到2000年，全国人工造林保存面积为4666.7万公顷，封山育林面积3019万公顷。

近十年来，中国政府颁布了《城市市容和环境卫生管理条例》、《城市生活垃圾管理办法》、《关于印发推进城市污水、垃圾处理产业化发展意见的通知》、《关于加强生活垃圾填埋场气体管理工作的通知》、《生活垃圾填埋污染控制标准》、《城市生活垃圾处理及污染防治技术政策》等法规、行政条例、政策和标准，为城市垃圾处理和处理过程中污染防治等工作提供了依据。截至2001年底，中国共有741座垃圾处理场，其中卫生填埋场571座、堆肥厂134座、焚烧厂36座。

中国政府重视气候变化领域的国际合作，分别与一些国家和国际组织开展了广泛的交流与合作。在能效和可再生能源领域，中国政府有关部门利用世界银行和全球环境基金的资助，实施了“中国终端用能效率”、“中国节能促进”和“加速中国可再生能源商业化”等项目；在林业领域，近10年来，国家林业局在中国20多个省、自治区、直辖市执行了国际合作或援助项目共达269个。

五、气候系统观测与研究

中国已经基本建成了三维立体综合大气观测网。目前拥有基准气候站 143 个，基本气象站 530 个，一般气象站 1736 个。大气观测存在的主要问题是地面观测站布局东密西疏；随着城市的发展，气象观测站的环境受到了影响；一些重要观测项目的标定工作还不够完善；高空探测手段单一；青藏高原高空观测很少；大气成分观测站点少，分布不合理，观测项目少；观测仪器与方法、测试分析手段、质量控制等方面基础薄弱。

中国初步建成了由海洋观测站、志愿观测船、浮标观测、海洋调查船、全国海洋验潮网、岸基测冰雷达、“中国海监”飞机组成的比较完整的海洋监测系统。但现有的海洋观测站大都建在大陆海岸上，数目偏少，分布也不均匀；观测设备落后，观测项目多数是海洋水文气象，海—气通量观测较少。

陆地观测系统主要由水文系统、冰冻圈、生态系统、农业气象、环境保护等观测站网组成。目前存在的问题是各类观测网没有形成一个规范、协调的连续观测网。

中国的卫星遥感观测在天气、气候灾害监测和预警中发挥了重要作用。从气候变化监测和研究的角度看，遥感监测的不足主要表现在反演的气候参数少、时间序列短；数据处理不够规范、序列性差；气候分析和应用技术能力比较薄弱。

中国的气候系统信息建设具有一定基础，特别是大气观测资料具有规范的管理办法。但目前气候系统观测资料的收集、存储、质量控制、分发等缺乏统一协调和共同标准。

今后，中国将在广泛国际合作的基础上，进一步发展、完善本国和本地区的气候系统观测网络，加大气候系统资料管理的力度和资料共享的程度，有效地适应气候变化对本国、本地区的影响。

在气候变化科学研究方面，中国开展了大量工作。在过去的 20 余年，中国的科学家对中国气候变化的历史事实及其可能原因、未来人为引起的气候变化可能情景、气候变化对中国主要敏感经济部门和脆弱地区的可能影响，以及全球减缓气候变化政策、措施对中国的可能影响与中国减缓气候变化的战略和措施等，开展了许多研究工作，取得了初步的系列成果，为国家制定应对气候变化问题政策和履行国际气候公约活动提供了科技支撑，也为未来的科学发展奠定了基础。

在气候变化研究国际合作方面，中国有关部门与亚洲开发银行、联合国开发计划署、全球环境基金等国际机构，以及美国、加拿大、英国、挪威、意大利、德国、瑞士等国政府合作，先后开展了多项能力建设项目和合作研究。

但是，中国的气候变化科学研究也还存在一些问题，主要表现在：在研究方面的资金投入有限；没有建立起完善的气候变化检测与模拟系统；自然科学和社会科学的跨学科研究仍然不够，具有创新性和实用性的科研成果还不多。今后，中国将进一步加强对科学研究的支持力度，开展国家气候变化科学评估活动，继续积极参加 IPCC 相关活动，加强国际

合作和交流。通过加强科学研究，中国将努力为国际社会和国内有关部门更好地应对气候变化问题提供坚实可信的科学信息。

六、教育、宣传与公众意识

气候变化的宣传和教育是推动全社会共同参与减缓和适应气候变化行动的重要手段。近年来，中国加大了气候变化问题的宣传和教育力度，在提高公众气候变化意识以及促进可持续发展方面作出了很大努力，主要表现在：经过多年努力，中国已初步建立起包括正规教育和非正规教育在内的教育体系，涵盖了可持续发展、环境保护和气候变化等方面的内容；组织了全国性的公众气候变化意识问卷调查，范围涉及高校学生、中学生、机关公务人员、工人、农民、街道、社区居民等；加大了媒体对气候变化问题的宣传力度，如在《中国青年报》开办“气候变化”专版，在中央人民广播电台播出“气候变化”专题节目等；建立了中国气候变化信息网站及其他相关网站，为了解国内外气候变化领域的最新动态及我国在此领域的相关政策和措施等开辟了信息渠道；开展了多种形式的有关气候变化的知识讲座和报告会；多次举办气候变化科学大会；举办了数百个与气候变化相关的国内、国际研讨会；组织了多期气候变化与环境论坛；编写和出版了多种气候变化方面的出版物和宣传材料；利用各种重大环境活动和科普设施等开展形式多样的关于气候变化的宣传教育。

这些活动的开展极大地增强了公众气候变化方面的意识。但有关公众气候变化意识调查的结果表明，目前中国广大公众气候变化方面的意识还有待进一步提高，宣传、教育还需要继续加强。中国将认真履行《公约》在教育、培训和公众意识方面的要求，将继续在气候变化宣传教育方面作出不懈努力。同时，也希望国际社会在气候变化教育、宣传与提高公众意识等方面继续给予支持。

七、资金、技术和能力建设方面的需求

中国是发展中国家，经济发展水平低，技术开发能力不足，面临发展经济与保护环境的双重压力。作为《公约》非附件一缔约方，要有效履行《公约》下的承诺，需要发达国家按《公约》的要求，在资金、技术以及能力建设等方面提供帮助，以提高中国减缓、适应气候变化的能力和相关研究水平。

中国温室气体清单编制是一项长期和复杂的技术性工作，不仅需要清单编制人员具有一定的业务素质和专业水平，而且也需要保持人员的连续性与稳定性，需要发达国家提供相应的资金与技术支持，开展培训和国际交流等活动，提高中国编制温室气体清单的能力；中国现有的统计指标体系与国际社会存在一定程度的差异，希望获得国际社会的技术与资金支持，提高获取编制温室气体清单所需基础数据的能力，以减少国家温室气体清单的不确定性；为科学准确地确定排放因子，在工业锅炉与工业窑炉、生物质燃料燃烧、稻田、动物、森林生物量土壤碳等排放因子的测试技术与设备方面，有必要给予中国相应的资金与

技术支持。

中国减缓气候变化的技术需求主要有：环保及资源综合利用方面的技术，各种能源技术，交通运输领域的先进技术，材料与制造业方面的先进技术，以及建筑等其他方面的先进技术。中国在农业、自然生态与林业、水资源、海平面与海岸带、荒漠化与自然灾害等领域对气候变化比较敏感和脆弱，也需要获得相关的资金与技术支持。中国在气候观测系统的主要技术需求为：大气与海洋观测方面的各种先进技术，气象、海洋、资源卫星技术，以及其他有关方面的技术。

《马拉喀什协议》中提出的发展中国家能力建设需求在中国都普遍存在，当前，中国已于2003年底启动了“国家能力需求自评估”项目，该项目将全面评估中国的能力建设需求，将于2004年底完成。

Executive Summary

The United Nations Framework Convention on Climate Change (UNFCCC) stipulates that all Parties to the Convention should, on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities, protect the climate system for the benefit of present and future generations of mankind. The Convention requires all Parties to submit national inventories of anthropogenic emissions by sources and removals by sinks of greenhouse gases (GHGs), as well as to promote exchanges of information on climate change and measures to deal with it. In accordance with the Guidelines for the Preparation of Initial Communications by Parties Not Included in Annex I to the Convention as contained in Decision 10/CP.2, the National Coordination Committee on Climate Change prepared the Initial National Communication on Climate Change of the People's Republic of China by consulting officials and experts from relevant government departments, social organizations, scientific research institutions, universities and enterprises. The contents and nationwide data in this report do not include that of the Hong Kong Special Administrative Region, the Macao Special Administrative Region and Taiwan Province except for division of administrative areas, territory and other points specified.

1. National Circumstances

China covers a land territory of approximately 9.6 million square kilometers and an adjacent sea area of some 4.73 million square kilometers. China's climate is characterized by two distinct types, the continental monsoon climate and the complex climate. The precipitation in China varies markedly between the seasons, with rain falling mostly in summer, and is distributed very unevenly from region to region. Topographically, China slopes from the west to the east, forming three distinct terraces. Mountainous regions, hilly areas and plateaus comprise 66% of the total territory. China has a shortage as well as an uneven distribution of water resources. China's per capita water resources are about one fourth of the world average and per capita energy resources are less than half of the world average.

China is the world's most populous country. In 1994, China's mainland population was 1.185 billion and those employed totaled 674.55 million, with an employment ratio of 54.3: 22.7: 23.0 in the primary, secondary and tertiary industries. China's urbanization level was 28.5% in 1994, and this has increased to 36.2% by 2000.

China is a low-income developing country with a prominent disparity in economic development in different regions. China's total GDP in 1994 was RMB4.6759 trillion with a per capita figure of only RMB3901. The ratio of per capita GDP between China's eastern, central and western regions was 1: 0.59: 0.44 in 1994, highlighting the disparity in regional development levels. The breakdown of the GDP across the primary, secondary and tertiary industrial sectors in that year was 20.2: 47.9: 31.9. The annual net income of rural residents averaged RMB1221 while the average disposable income of urban residents stood at RMB3496. The residential electricity consumption per capita was 72.7 kWh in 1994.

2. National Greenhouse Gas Inventory

The National Greenhouse Gas Inventory for China in the year 1994 includes estimated net anthropogenic

GHG emissions from the energy sector, industrial processes, agriculture, land-use change and forestry, and wastes, and reports on emissions of such gases as carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O):

The energy activities inventory mainly covers emissions of CO₂ and N₂O from the combustion of fossil fuels, emissions of CH₄ from coal mining and post-mining activities, fugitive emissions of CH₄ from oil and natural gas systems, and emissions of CH₄ from the burning of biomass fuels. The industrial processes inventory includes emissions of CO₂ in the production processes of cement, lime, iron and steel, and calcium carbide, as well as emissions of N₂O in the production process of adipic acid. The agricultural activities inventory covers emissions of CH₄ from flooded rice paddy fields, animal enteric fermentation and manure management as well as emissions of N₂O from croplands and animal waste management. The land-use change and forestry activities inventory mainly covers changes in the stocks of forests and other ligneous plants as well as emissions of CO₂ due to the conversion of forests to non-forest land. The waste treatment inventory mainly covers emissions of CH₄ from treating municipal solid waste and that from treating municipal domestic sewage and industrial wastewater.

The 1994 Inventory has been prepared with methods provided by the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* and using *IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* as a reference. The inventory agencies established the technical approaches for developing the 1994 National Inventory on the basis of defining China's sources of emissions, ascertaining the key sources of emissions, the availability of activity data and emission factors and analyzing the applicability of the IPCC methodologies.

According to the estimated results, China's total net emissions in 1994 are: CO₂, 2666 million tons (728 million tons of carbon equivalent), among which emissions from energy activities amount to 2795 million tons and emissions from industrial processes amount to 278 million tons whilst emission removals by sinks from land-use change and the forestry sector amount to 407 million tons; CH₄, 34.29 million tons, among which emissions from agricultural activities amount to 17.2 million tons, emissions from energy activities amount to 9.37 million tons and emissions from waste treatment amount to 7.72 million tons; N₂O, 850,000 tons, among which emissions from agricultural activities amount to 786,000 tons, emissions from industrial processes amount to 15,000 tons and emissions from the energy sector amount to 50,000 tons. Calculated according to the Global Warming Potential (GWP) values provided by the IPCC's Second Assessment Report, China's total GHG emissions in 1994 was 3650 million tons of CO₂ equivalent, with CO₂, CH₄ and N₂O contributing to 73.05%, 19.73% and 7.22% of the emissions respectively.

In order to reduce uncertainty on the estimated results of the GHG inventory, efforts were made to perfect work on data quality, methodology and reporting format. To ensure accuracy of the data, official statistics were used as far as possible coupled with sample surveys and on-the-spot examinations and at the same time taking into account the default values recommended in the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* and the *IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*. With regard to the method used, while IPCC methodologies were followed in general, some improvements were made in accordance with the national conditions of China, thus ensuring the comparability, transparency and consistency of the estimates in the inventory. As to the format of report, the format recommended by *Guidelines for the Preparation of Initial Communications by Parties Not Included in Annex I to*

the Convention was adopted to the extent possible.

There are still some uncertainties in the inventory, the reasons for which are: Firstly, as a developing country, China has a relatively weak position with regard data, and in particular has many difficulties in obtaining activity data for estimating GHG emissions; Secondly, though sample surveys and on-the-spot examinations were carried out to some extent in the energy, industrial processes, agriculture, land-use change and forestry, and waste treatment sectors to collect the basic data for inventory development, the time span and specific sample observation points may not be fully representative due to the constraints in funding, time available and other factors.

The principal factors affecting China's future GHG emissions are: population growth and increasing urbanization, the changes in the pattern of economic development and consumption, the expansion in people's daily necessities, the adjustment in economic structure and technological progress, and the changes in forestry and ecological preservation and construction. Analysis shows that on the one hand, the growing need for daily necessities and economic development in China in the future will result in more GHG emissions, whereas on the other hand the implementation of a sustainable development strategy will enable China to do its best within the limit of its capacity and development level to reduce the growth rate of GHG emissions. Thus China can make positive contributions to mitigating global climate change while emissions have to be necessarily increased.

3. Impacts of Climate Change and Adaptation

Chinese scientists began to assess the impacts of and vulnerability and adaptation to climate change since the early 1990's. The studies were concentrated on the four areas closely related to the economy, namely, water resources, agriculture, terrestrial ecosystems, and the coastal zones including offshore marine ecosystems. The models used for assessing the impacts of climate change have mainly been introduced from abroad, whilst few models have been developed in China. The assessment on the impacts of climate change is preliminary and there are still a lot of uncertainties. The initial results are now outlined.

The trend of climate change in China in the past century is corresponding to the general trend of global climate change, and the 1990's was one of the warmest decade in the last 100 years. In terms of geographical distribution, it can be seen that the warming trend was the most obvious in northwest, northeast, and northern China, while not so obvious in the areas south of the Yangzi River. Furthermore it can be seen that the warming increment in winter is the most obvious effect during the seasonal cycle. China experienced abundant precipitation in 1950's and then a progressive decrease since 1950's onward, which has lead to a warm and dry climate in northern China. Though some differences exist between different simulations of global climate models (GCMs), it can be seen that an overall general trend from most GCM projections are that the warming would continue and the precipitation would increase under the scenarios where equivalent CO₂ concentration in the atmosphere continues to increase from 1990 onwards and taking into account the interaction with the levels of sulfate aerosols. Several studies on the extreme weather/climate events also show that the extreme cold events are likely to decrease, while the extreme hot temperature events are likely to increase, and the drought and flooding are likely to be enhanced.

It can be seen from observations during the past 40 years that the runoff of the major rivers in China has

decreased. There has been a continuous drought in the North China Plain since the 1980s, while flooding disasters have happened frequently in southern China. This impact has been especially enhanced since the 1990s. It can be seen from the assessments on the impacts of climate change under the SRES (IPCC Special Report on Emission Scenarios) scenarios A2 and B2 that the amount of runoff is likely to decrease in northern China and increase in southern China. This will intensify the water shortage in northern China and consequently affect the sustainable development of society. Since climate warming occurred in the 20th century, the mountain glaciers in China have been shrinking, the glacier area in the west China has reduced by 21% over this period. The melting of glaciers does seem to mitigate the reduction of mountain runoff to some extent in the near future, but also threaten the future exploitation of the glacier as water resources. Climate warming would speed up plant growth and shorten the crop growing period, and consequently would affect the accumulation of dry biomass and the grain yield. It seems that the adverse impacts of climate change would increase the costs of future agricultural production. Current assessments show that there would be an overall decreasing trend for the major crops in China due to climate change. Climate warming would influence the distribution of climate resources over time and space, and accordingly induce changes in cropping systems. Under the scenario where the concentration of CO₂ in the atmosphere doubles, the single crop season area would reduce by 23.1%, whilst the double cropping area would extend to the middle of the present single cropping area. The triple cropping area would increase from its current levels of 13.5% to 35.9% and its northern boundary would extend 500 km northwards, from the present Yangzi River valley to the Yellow River basin. Likewise, changes would also take place in the distribution of major crops in China. Simulations indicate that the potential food production would decrease by 10% due to climate change and extreme climate events during 2030~2050, under the present cropping system, present crop varieties, and present management levels. There would be an overall decreasing trend for wheat, rice, and maize yield.

The impacts of climate change on the ecology of China can be predicted from observations such as the advance of the seasonal cycle in northeast, north China, and along the lower reaches of the Yangzi River where records since the 1980's show the temperature has been increasing in spring. The vegetation zones or climate zones would move to high latitudes or westwards, and there would also be corresponding changes for scope, acreage, and demarcation lines of vegetation zones. Climate change would have the most obvious impacts on the forests in southwestern, central, and southern parts of China. Climate change would not have obvious impacts on the geographical distribution of preliminary productivity of forest, but the productivity and yield of forests might increase to some extent. However, the forest fixed biomass might not increase because of the increased likelihood of more disease and pest problems and the increased likelihood of forest fires due to climate change, the suitable area for the current tree species might decrease. The climate over the pasture in northern China would become warmer and drier, and the pasture varieties in the arid areas would move to the wet areas, i.e., the present demarcation lines of grassland would move eastwards. It is also shown from the simulation that there would be great impacts of global warming on the frozen earth, marshes, and deserts in China.

With regard the impacts on coastal zones, it can be seen that there is an increasing trend of sea level rise along China's coast since the 1950s and this trend has become significantly more obvious in the past few years. The sea level currently has a rate of rise of 1.4~2.6 mm per year. Chinese scientists have used a sea level rise model to project that the relative sea level rise over five typical coastal zones would range from 31cm to 65 cm by 2100, which would aggravate the coastal erosion. The intrusion of seawater into the river mouth would be enhanced, and it would degrade the fresh water quality and adversely affect the fresh water supply along the river mouth.

The relevant adaptation measures already taken mainly include: promulgating 13 related laws and regulations; constructing water conservation projects, such as strengthening the embankments against flooding along major rivers, diverting water from the South to the North; adjusting the agricultural structure and cropping systems; cultivating and spreading the new drought-resistant varieties; establishing the nature reserve zones, forest parks, and natural forest conservation zones.

The relevant adaptation measures to be taken mainly include: developing water-conservation agriculture and industry; protecting and improving ecological environments; cultivating disease- and pest-resistant varieties; converting some of the cultivated land to pasture, forest, and grassland; improving agricultural infrastructure, curbing and stopping deforestation and ecological damage; expanding the use of nature reserves; setting up and strengthening the monitoring, forecasting, and early warning systems for control of fire, disease, and pests of pasture and forest; raising the standard of embankments; strengthening the construction of coastal infrastructure against the tide.

4. Policies and Measures Related to Climate Change Mitigation

Since the 1980s, China, in accordance with its own national conditions and capacity and through carrying out various policies and measures, has succeeded in supporting a rapid economic development with a relatively low growth rate of energy consumption and greenhouse gas emissions, thus making a positive contribution to relieving the increase of greenhouse gas emission and protecting the global climate.

Since 1992, the Chinese government has taken a series of actions and measures and effectively pushed forward the process of China's sustainable development. In 1994, China's sustainable development strategy, China's *Agenda 21*, was formulated and released. In 2003, the Chinese government formulated the *Program of Action for Sustainable Development in China in the Early 21st Century*. In compliance with the principles and spirit of sustainable development, China enacted numerous laws on protecting natural resources and the environment. Beginning from the late 1980s, the Chinese government started paying more attention to the transformation of the economic growth pattern and the adjustment of the economic structure. A key component of China's industrial policies is to reduce consumption of energy and other resources, improve the comprehensive utilization and efficient use of resources and energy, promote cleaner production and prevent and control industrial pollution. The State Council and its relevant departments respectively promulgated the *Decision on the Focus of the Present Industrial Policy*, the *Outline Program of State Industrial Policy in the 90s* and the *List of Industries, Products and Technologies Currently Encouraged by the State*. Since the 1990s, the government has closed down a large number of enterprises that used backward technologies or had high consumption of energy and materials or caused serious pollution. The Chinese government has drafted and implemented a series of incentive policies in terms of finance, credit and taxation toward energy conservation projects, including interest payment rebates, differential interest rates, revoking of import taxes, reduction of income tax of enterprises and accelerated depreciation, etc. These measures have been applied to energy conservation technical upgrade projects and purchases of energy conservation equipment. Other tax reductions or exemptions have been applied for projects in the areas of comprehensive utilization of resources, power generation from municipal wastes, wind power generation and renewable energy in rural areas.

Since the 1980s, the Chinese government has carried out a series of reforms, policies and measures in the

energy sector, optimized the energy structure and promoted the technical progress and raising of the sector's efficiency. Marketization has been achieved in the investment and pricing of the coal industry. The petroleum and natural gas industry has been reorganized with the establishment of the China National Petroleum Corporation (Petro China) and the China Petroleum and Chemical Corporation (Sinochem). International practice has been followed in the pricing of crude and refined oil products. Pluralistic investment and ownership in the electricity industry has been established and the separation of government and enterprises in the electricity sector completed. Beginning from the drafting of the Sixth Five-year Plan for National Economic and Social Development, the Chinese government has incorporated energy development and conservation plans into the national economic and social development plans. By the year 2000, the Chinese government had formulated energy conservation plans from the sixth to the tenth five-year plan periods and energy conservation plan for each year, identifying concrete development goals, key projects and principal policies for energy development and conservation. From 1995 to 2000, China's installed capacity of hydroelectric power witnessed an average annual increase of 8.7%. In 2000, the installed capacity of nuclear power generation in operation stood at 2.1 GW with a further 6.6 GW under construction. 26 wind farms were built and connected to the grid with their installed capacity growing from 30 MW in 1994 to 375 MW in 2000. From 1990 to 2000, 13.1 GW of small thermal power units were substituted. From 1996 to 2000, about 10 GW of coal-fired condenser units, which were below 50MW each, were shut down. From 1995 to 2000, the proportion of the thermal generating plant with unit rating 300MW and above rose from 22.5% to 34.4% as a percentage of the total capacity. In the same period, the installed capacity of combined heat and power units rose from 16.54 GW to 28.68 GW, averaging an annual increase of 11.6%. The share of oil and natural gas in China's primary energy production went up from 19.5% in 1994 to 25.2% in 2000. In compliance with the goals of national poverty eradication and energy development in the rural areas, the state has formulated a series of policies and measures for supporting and fostering the development of new and renewable energy. By 2000, hydropower stations in more than 1,500 counties in China had been developed comprising some 40,000 rural hydropower stations with the total installed capacity of 24.8 GW and generating about 80 billion kWh of electricity per year. In addition to wind power and small-scale hydropower stations, China has energetically popularized firewood- and coal-conservation stoves, biogas, solar energy and geothermal technologies in rural areas. In 1994 and 2000, the utilization of renewable energy equaled to respectively 10.26 million tons and 33.57 million tons of coal equivalent.

For a long time, the Government of China has persisted in the principle of "developing and conserving energy simultaneously, with conservation put in the first place". After the 1980s, the State Council and government departments in charge at various levels formulated and implemented a series of energy conservation rules and regulations, set up a three-tier energy conservation management system at the central, local/industrial and enterprise levels and implemented a series of policies on energy-conservation technologies. They launched the national "energy-conservation publicity week", established and applied standards, labeling and certification of energy efficiency and effectively boosted the work on energy conservation and raising energy efficiency. From 1980 to 2000, China's energy intensity went down by an average annual rate of 5.32%.

The Government of China has also consistently focused on energy conservation in the energy intensive industries. From 1990 to 2000, the output of iron and steel doubled, yet its total energy consumption increased only by 34%. During the same period, the energy consumption for each RMB10,000 of production output in the chemical industry declined by an annual rate of 5.15%. The building materials industry has also undertaken a series of measures and lowered the per unit energy consumption of their products.

Since the 1980s, the State Council and its relevant departments successively promulgated and implemented a series of policies and regulations to direct and standardize the energy conservation work of the construction sector, such as the *Circular on Opinions on Accelerating Innovation in Wall Materials and Popularizing Energy-conservation Buildings*, the *Policies on Energy-conservation Technologies in Buildings* and the *Regulations on Management of Energy Conservation in Civil Buildings*. The released standards for energy conservation in buildings mainly include the *Design Standards for Energy Conservation in Civil buildings (the part of heated residential buildings)*, the *Grading of Insulation of the Outside Windows of Buildings and Its Testing Method*, the *Design Standards for Lighting in Civil Buildings*, the *Design Standards for Thermal Engineering in Civil Buildings*, the *Design Standards for Energy Conservation in Thermal Engineering and Air Ventilation in Tourist Hotel Buildings*, the *Technical Directive Rules on Energy Conservation Renovation of the Existing Residential Buildings* and the *Design Standards for Energy Conservation in the Residential Buildings in Areas Unusually Hot in Summer and Cold in Winter*. Starting from 1992, the Ministry of Construction began a pilot program for energy conservation in buildings and at the end of 2000 had accumulatively built around 180 million square meters of energy-conservation buildings. During the 1996 - 1998 period, the China Green Lighting Program popularized a total of 267 million high-efficiency lighting products and saved 17.2 billion kWh of electricity.

Since the 1980s, the relevant government departments drafted and implemented regulations and standards such as the *Provisional Detailed Rules on the Management of Energy Conservation in Railways*, *Policy on Energy Conservation Technologies in Railways*, *Detailed Rules on the Implementation of Energy Conservation Law in the Transportation Industries*, *Standards for the scrapping of motor vehicles*, *Regulations on Energy Conservation in Railway Engineering Design*, *Rules for the Publication of Energy Conservation Products of Automobiles and Vessels*, *Limits for Automobile Emission of Pollutants and Their Testing Method*. Certain progress has been made in the development and application of substitute fuels for motor vehicles. By the end of 2003, the Air Cleaning Program - Clean Automobile Action set up nationwide 16 key demonstration sites for clean automobiles. Gas-driven automobiles numbered 193,000 and 594 gas stations were built.

Since the 1980s, China has widely applied the household-based contract system to the pastures, identified the responsibilities, rights and interests in the construction and protection of pastures and mobilized the enthusiasm of the great masses of herdsmen in developing animal husbandry and protecting the grassland. In breeding and popularizing good strains of forage grass, every year the acreage of seeding reached 40,000 hectares, that of aerial seeding 1.5 million hectares and the vegetation coverage of pastures rose to above 80%. Accumulatively 16 million hectares of artificial and improved pastures and 10 million hectares of fenced pastures were built. In total, 90 million hectares of pastures were prevented from rat and pests damage.

Since 1980, China successively formulated and amended the forestry laws and regulations such as *Rules on the Implementation of Forest Law*, *Rules on Forest Fire Prevention*, *Rules on Plant Disease and Pest in Forests*, *Regulations on Converting Cultivated Land to Forest* and *Regulations Concerning Urban Afforestation*. The systems of compensation for forest ecological benefits, voluntary tree planting by the people, pricing of forests, forest funds, loans for afforestation and forest certification were established. China successively carried out ten forest ecological programs including the shelterbelt development programs in the "Three Northern regions", upper and middle reaches of the Yangtze River and other key regions as well as natural forest resources protection programs. In 2000, the acreage of conserved artificial forests nationwide was 46.667 million hectares and the acreage of hillsides closed for afforestation reached 30.19 million hectares.

In the past decade or so the Chinese government has issued a series of such administrative regulations, policies and criteria for waste treatment such as the *"Rules on the Management of Urban Appearance and Environmental Sanitation"*, *"Rules for Handling Municipal Garbage"*, *"Notice for Issuance of Opinions on Pushing Forward Industrialization Development for Municipal Sewage and Garbage Treatment"*, *"Notice of Strengthening Management Work on Landfill Gas Emissions"*, *"Pollution Control Criteria on Landfills for Domestic Garbage"* and *"Policy on Technology for Treatment of Domestic Garbage and Pollution Prevention"*. All these regulations have provided the basis for the treatment of municipal wastes and the prevention of pollution in the course of treatment. Up to the end of 2001 there were a total of 741 garbage treatment sites in China, of which 571 were used for sanitation landfill, 134 for compost and 36 for incineration.

The Chinese government has all along attached great importance to international cooperation in the field of climate changes and it has conducted extensive exchanges and cooperation respectively with a number of countries and international organizations. In the fields of energy efficiency and renewable energy development, the relevant departments of the Chinese government have, by using the support of the UNDP, World Bank and the Global Environment Facility, implemented the projects such as the *"China End-Use Energy Efficiency Project"*, the *"China Energy Conservation Project"* and *"Capacity Building for the Rapid Commercialisation of Renewable Energy in China"*. In the forestry field, the recent 10 years have witnessed the execution by the State Forestry Administration of international cooperation and aid programs totaling 269 in all in more than 20 provinces, autonomous regions and municipalities directly under the central government.

5. Research and Systematic Observation

China has established a large three-dimensional network for comprehensive observation of the atmosphere. Currently it owns 143 reference climate stations, 530 basic weather stations and 1,736 ordinary weather stations. Presently the main problem for meteorological observation lies in the uneven distribution of observation stations that are laid out densely in the east but sparsely in the west. Along with the increasing urbanization, the environment for meteorological observations has changed. Furthermore the work to standardize airborne observation equipment and measurements needs improving. The measures for airborne observation were simplistic in some way. There were few airborne observation stations over the Qinghai-Tibet Plateau and insufficient atmospheric trace gas observations have been made. Furthermore there is a weak basis with regard to the observation equipment and methods, testing and analytic measures and quality control.

China has set up a relatively integrated marine observation and monitoring system consisting of stations for ocean observation, voluntary observation vessels, buoy observations, marine investigation vessels, a nationwide network for ocean tide testing, seashore ice-monitoring radars and *"China Haijian"* airplanes. However, most of the ocean observation stations are concentrated along the seashore of China's mainland and are limited in number and also distributed unevenly. The observation equipment and facilities are backward while the observation data is mostly for oceanic hydrometeorology with only a few observations made for sea-atmosphere interaction.

The terrestrial observation system mainly consists of a network measuring data for hydrological systems, ice-snow, ecological systems, agro-meteorology and environmental protection and so on. The main problem currently is that the network of different channels has not been integrated into a sizable and coordinated one necessary for continuous observations.

The Chinese meteorological satellite for remote-sensing observation has played an important role in the monitoring and warning of the weather and meteorological disasters. With regard the monitoring and study on climate changes, the weaknesses of the remote-sensing observation lies in the limited number of weather parameters monitored, the short time-series available, the non-standard data-processing and the relatively weak domestic ability in climate analysis and modeling techniques.

There is currently a certain infrastructure for the construction of a climate information system in China and especially in the regular management of the data obtained in atmospheric observation. However, at present the collection, storing, quality control and dispersion of the climate observation data lack an integrated, coordinated and common standard approach.

In the future, China will further develop and improve the national and regional network for systematic climate observation on the basis of extensive international cooperation, strengthening the management and sharing of the climate system data, and thereby adapt effectively to the impact of climate changes in its own territory.

China has done a lot of work in the scientific study of climate changes. Over the past 20 years, the Chinese scientists have carried out a great deal of work in such studies as on the historical facts and possible causes of climate changes in China, possible climate change scenarios induced by human activities in future, the possible impacts of climate change on China's sensitive economic sectors and vulnerable areas, the possible impacts on China's economy entailed by international policies and measures for mitigating climate changes as well as the national strategy for addressing climate change and so on and so forth. In these aspects China has conducted a lot of research work and has achieved a series of initial results, thus providing scientific support to the country in working out policies to deal with the climate change problem and to implement the UNFCCC, and has also laid a foundation for the development of climate science in the future.

In terms of international cooperation for the study of climate changes, the Chinese departments concerned have carried out many projects for capacity building and cooperative studies together with such international organizations as the World Bank, Asian Development Bank, the UN Development Program and the Global Environment Facility and with the governments of the United States of America, Canada, United Kingdom, Norway, Italy, Germany and Switzerland.

Nevertheless, there still exist several problems in the scientific study on climate changes in China. These problems include the limited investment for the study of climate change and the fact that a system for climate change detection and modeling hasn't been established yet. Furthermore China does not have enough trans-disciplinary studies between the natural sciences and social sciences and has not had many innovative scientific results that can be practically applied. Going forwards, China will further strengthen the support for the scientific studies, carry out activities for scientific assessment of climate changes and continue to take an active part in the relevant activities of the IPCC and strengthen international cooperation and information exchanges. By way of strengthening scientific research China will work hard to provide the international community and domestic departments concerned with more comprehensive and more reliable scientific information for dealing with climate changes.

6. Education, Training and Public Awareness

Improving education, training and public awareness on climate change is an important measure for persuading the whole of society to jointly participate in activities for the mitigation of and adaptation to climate change. In recent years, China has strengthened the training and education on climate change with great efforts made in enhancing the public awareness of climate change and for promoting sustainable development. This is mainly carried out via the channels of China's existing educational system, which includes regular and non-regular education, and topics have included education on sustainable development and environment protection and climate change. Additionally China has also organized a nationwide questionnaire on the awareness of climate change amongst different segments of the population including students of institutes of higher learning, high-school students, civil servants, workers, farmers, urban residents and social communities. Efforts have also been made through the media for strengthening the publicity on climate change, such as the "China Youth Daily" starting a special column entitled "climate change" and the Central Radio Station of China special program of "climate change". China has also set up websites on climate change, such as www.ccchina.gov.cn, which has opened up an information channel for people to learn about the latest developments on climate change at the national and international level and to find out the relevant policies and measures adopted in this field in China. Many lectures have been held on the basic knowledge and reports on climate change, and many domestic and international scientific conferences and seminars have been organized which are related to climate change. Aside from these public events, many internal talks and discussions have also been organized to consider the problem of climate change and the environment. Initiatives have been carried out to compile and publish various kinds of publications and publicity materials on climate change. China is also exploiting at every opportunity other important activities on the environment and related equipment fairs to popularize the training and education with regard to climate change.

All these activities have helped greatly to enhance the public awareness about climate change. However, the result of the survey of public awareness of climate change shows that there is much more to be done to further enhance the propagation of this knowledge and to ensure all segments of society continue to be educated about climate change. China will continue to carry out in an earnest way the education, training and public awareness on climate change as required by the UNFCCC. In the meantime, however, it is our hope that the international community will continue to support us in our education, training and awareness raising.

7. Needs for Funds, Technologies and Capacity Building

China is a developing country with a relatively low level of economic development and insufficient capability of technology development. Thus China is simultaneously facing the pressures of both economic development and environmental protection. As one of the non-Annex I Parties to the Convention, and in order to honor effectively the commitments as stipulated by the Convention, China needs developed country Parties to provide assistance to it in terms of funds, technologies and capacity building in line with their obligations under the Convention, so as to strengthen China's capacity for the mitigation of and adaptation to climate change and improve the level of relevant studies.

The development of a greenhouse gas inventory is a complicated and continuous work requiring special scientific knowledge. It needs not only those personnel engaged in the development of the GHG inventory to

have a certain professional quality and expertise but also it needs the continuity and stability of these personnel. It is necessary for developed countries to provide us with funds and technical support and to carry out capacity building activities and international exchanges so as to improve China's capability of preparing greenhouse gas inventories. There are certain differences between the existing statistics index system in China and that used in the international community. This is another area that requires the contribution of funds and technical support from the international community to improve the capability in obtaining the basic data for the greenhouse gas inventories and reduce the uncertainties in the national greenhouse gas inventories. To scientifically determine the emission factors, the input of funds and technological support is also required to get the measurement techniques and equipments for obtaining emission factors for fuel combustion in industrial boilers and kilns, combustion of biomass fuels, emissions from rice paddy fields and animals, biomass quantities in forestry and carbon contents in soils.

The technical needs for climate change mitigation in China mainly include: technologies related to environmental protection and the comprehensive utilization of resources, various energy technologies, advanced technologies for transportation, advanced technologies related to material and manufacturing industries, building sector technologies, etc. China is relatively sensitive and vulnerable to climate change in the fields such as agriculture, natural ecology and forestry, water resources, sea level and coastal belts, desertification and natural disasters. Technical support and funds are also needed for mitigating or adapting in these above mentioned areas. In the area of climate system observation, China's major technical needs include: various advanced technologies in regard to the observation of atmosphere and ocean, satellite technologies concerning meteorology, oceanography and resources as well as other relevant technologies.

In view of the needs for capacity building in developing countries as presented in the Marrakech Accord, China is in general faced with all these needs. China has already started the project of "Needs Assessment of National Capacity Building" by the end of 2003, according to which China will carry out a comprehensive needs assessment of its capacity building requirements in the field of climate change and this is scheduled to finish by the end of 2004.